Restoration, Enhancement, and Distribution of the ATLAS-1 Imaging Spectrometric Observatory (ISO) Space Science Data Set

Final Report

Title of Grant:	Restoration, Enhancement, and Distribution of the ATLAS-1 Imaging Spectrometric Observatory (ISO) Space Science Data Set
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Summary of research objectives and plan

The primary goal of the funded task was to restore and distribute the ISO ATLAS-1 space science data set with enhanced software and database utilities.

The first year was primarily dedicated to physically transferring the data from its original format to its initial CD archival format. The remainder of the first year was devoted to the verification of the restored data set and database. The second year was devoted to the enhancement of the data set, especially the development of IDL utilities and redesign of the database and search interface as needed. This period was also devoted to distribution of the rescued data set, principally the creation and maintenance of a web interface to the data set. The final six months was dedicated to working with NSSDC to create a permanent, off site, archive of the data set and supporting utilities. This time was also used to resolve last minute quality and design issues.

Year 1

- Initial data restoration — Complete
- Verify & validate data — Complete
- Verify & validate database — Complete
- Initial tools package — Complete

Year 2

- Upgrade database and search interface — Complete
- Develop utilities — Complete
- Create & maintain web interface — Complete
- Publicize data set — Complete

Year 2+

- Create NSSDC archival data set — In progress

Most important results

The principal accomplishments were 1) the successful rescue/restoration of the data set, 2) the development of an internal utility set for working with the raw data, 3) the enhancement of the mission database and database search utilities, 4) development of a user data analysis/viewing application, 5) creation of a web-based user interface to the database and automated data extraction utility, and 6) initiation of the process of creating an NSSDC archival data set.

A project web site has been created at http://csds.uah.edu/sio/isomain.html and is the public distribution site for data and software.

General summary

The most important accomplishment was the successful transfer of the ISO data set from the older equipment/ formats to newer, more stable, hosts. We first performed an emergency backup, in which VMS binary files were transferred without modification to CD-ROM. (We confirmed that the data could be successfully restored from CD-ROM to an available DEC Alpha platform.) This insured that the data would not be lost by premature failure of the older host system.

Then we started a second process in which the data was transferred directly from the obsolete VMS platform to the DEC Alpha platform, where it was converted from VMS binary to IDL save sets. These save sets were then stored on a NT server purchased under this grant. Neither the VMS or Alpha platforms had enough disk storage to process the full data set, so a streaming operation was set up from VMS to Alpha to Windows NT.

Finally, we backed up all the NT data files to CD and moved the backup disks offsite.

The project proposal had suggested that we would eventually reformat the data for maximum efficiency at this point. However, our experience indicates that this was not necessary and this task was not be done. We also proposed a significant effort for database validation. Our experience, however, indicates that this will not be as large a task as we initially thought. For example, one survey of 9 days of data (160,038 4-second frames) yielded a total of 180 missing frames. This is a failure rate of 0.1%.

With the data safely restored, we focused attention on efforts to develop basic IDL utilities for data manipulation. This includes a data retrieval algorithm that takes results from a database search (discussed below), extracts requested spectral data, retrieves associated dark spectra (backgrounds), removes the dark spectra, and performs spectral 'flatfielding' and other calibration tasks. This is all transparent to the user who is supplied data products of spectra and instrument housekeeping. This product runs on the NT server and is part of the server-side response to web-based data requests.

Extensive enhancement of the mission database tables and the search interface was performed. The original database consisted solely of instrumental parameters (gain, grating step, door position, temperature, etc.). The user interface allowed only very limited queries of that data set. We added tables of line-of-sight parameters (location, altitude, sun direction, etc.) and upgraded the user interface to search on these parameters. We also changed the interface to use descriptive variables ('Instrument on and operational' instead of single gain settings, and selected wavelength region instead of grating step, for example).

With the successful restoration of the ISO data set, activity in the second year of the project focused on two tasks: development of an online user interface for browsing and requesting data, and development of utilities to allow users to easily work with the data.

The online interface is hosted from the project web site and includes the ability to search on geophysical parameters--in contrast to the purely instrumental parameters allowed in the original version--as well as specifying spectral regions or features of interest. The user is allowed to refine the search parameters and then to request that the data be extracted and made available for download. This is performed by an automated server-side request handler and data extraction utility that deposits the extracted data product in a user-specific ftp download site. The user is notified of the completion of the extraction process by email, if requested.

Another major task was development of a user application for viewing and analyzing the data retrieved from the online interface. An IDL graphical user interface was developed that allows metadata visualization (location, line-of-sight, tangent ray height, etc.) and data visualization (temporal evolution, spectral surveys, feature identification, and interactive data exploration). Data quality features such as background removal and calibration are performed by the server-side extraction routine. An automated analysis routine that identifies spectral features, using a spectral database we have compiled, and fits spectral lineshapes to each feature is also included in the user software. This process also returns the integrated intensity under each line. Additional features include a command line interface to

the software library, curve fitting routines, and intensity analysis capabilities. The software utilities are available for download from the project web site.

Remaining Tasks

Our current data distribution and utilities are exclusively in IDL formats. In recognition that this will not be acceptable to all users, especially the NSSDC, we are developing an alternative CDF format. (Note that this activity was not part of the original proposed task, but grew out of consultation with the AISRP office.) A CDF translator has been developed and we are working with NSSDC to finalize the format of the data product to meet their needs. We are also extending the documentation set to meet NSSDC concerns. Once the final format is approved, we will convert the data into this format and transfer it, with the software and documentation, to NSSDC. Though the funding for this task has ended, we are committed to completing the remaining tasks and are confident that they will be completed soon.

In summary, we are pleased to report that we have successfully completed all the proposed tasks. Furthermore, we are close to completing the additional task of creating an NSSDC archival data set and anticipate no problems. The PI wishes to commend all who made this project a success, especially Mr. Wesley Swift and Mr. Lee Adarr. The success of this project was heavily dependent on their efforts.